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D1K K24B2 K24C  
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(56) Documents cited

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(58) Field of search  
UK CL (Edition J) D1K  
INT CL<sup>4</sup> D04B

(54) Knitting tubular fabric with fashion lines on a flat machine

(57) When knitting an article such as a sweater 1 in a tubular seamless manner on a flat knitting machine fashion lines 7 are formed spaced from the edges of the fabric simultaneously with shaping of the fabric. By a process including transfer of loops between the beds and relative racking of the beds loops of each bed are transferred to adjacent needles of the same bed and as a result superimposed loops 71-74 are formed on certain needles which form the respective fashion lines 7 of the front and rear fabrics. A raglan-style fashion line may be formed on a four-bed machine with three loops being superimposed on each relevant needle.

FIG. 1

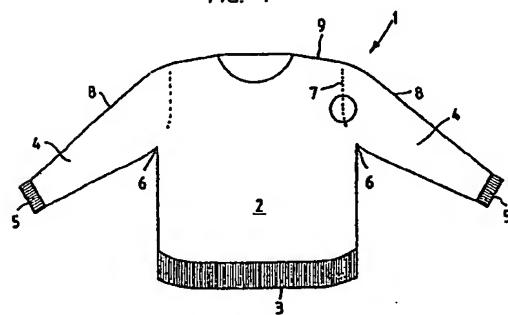
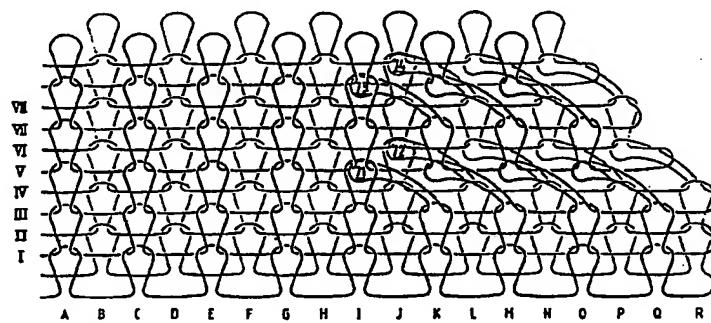


FIG. 2



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FIG. 1

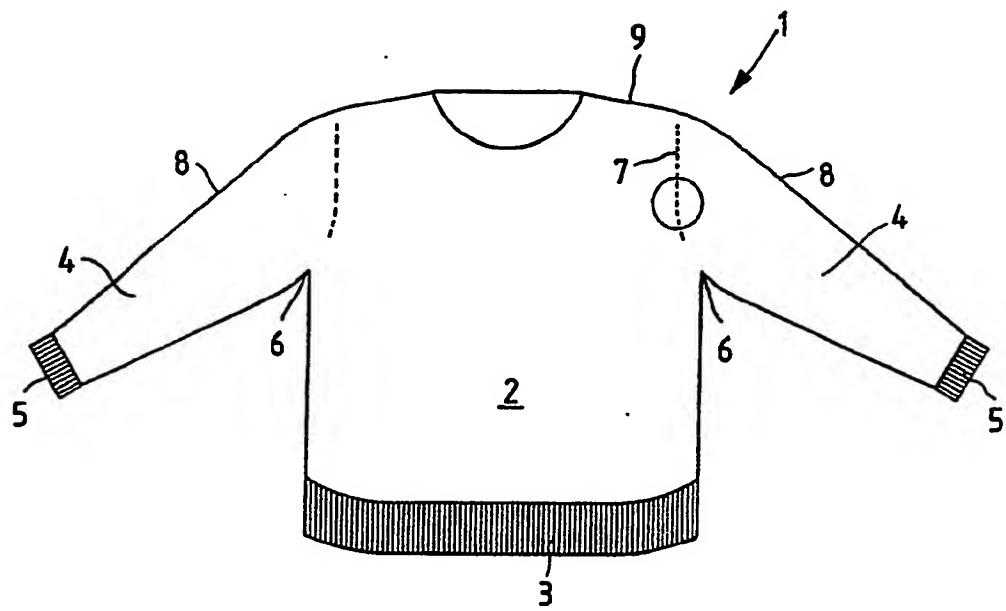
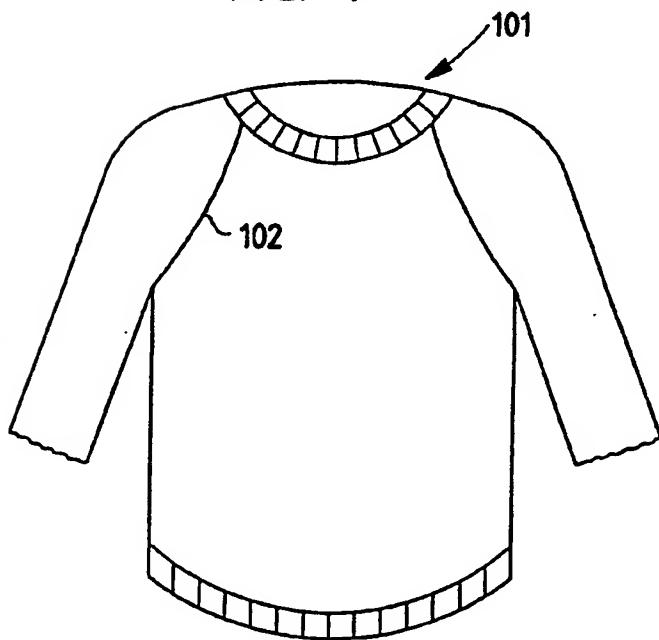


FIG. 4



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FIG. 2

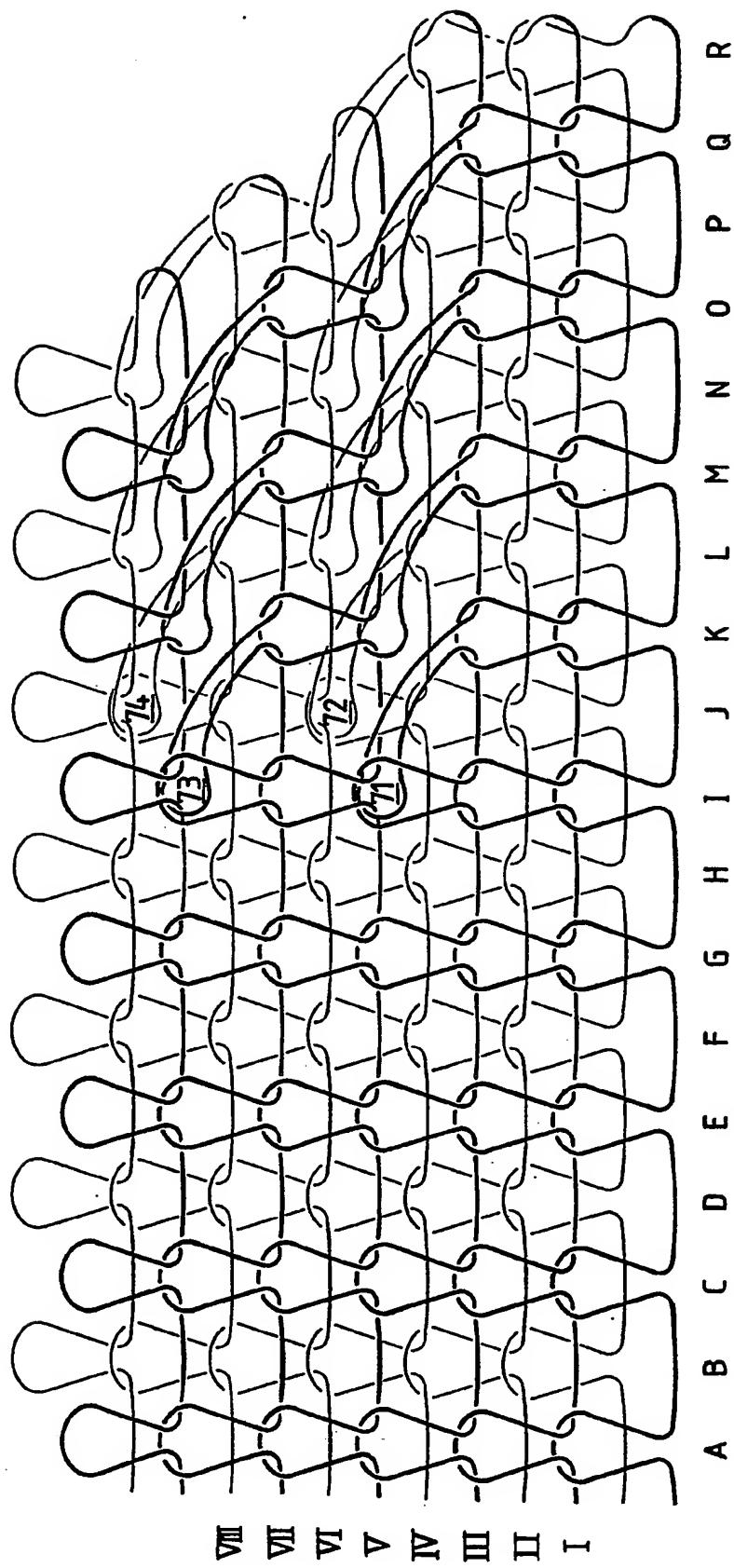


FIG. 3-1

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

FIG. 3-2

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

FIG. 3-3

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U <td>V</td> <td>W</td> <td>X</td> <td>Y</td> <td>Z</td>	V	W	X	Y	Z
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

FIG. 3-4

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

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KNIT STITCH OF FRONT PIECE  
 KNIT STITCH OF REAR PIECE  
 WELT IN FRONT PIECE  
 WELT IN REAR PIECE  
 STITCH TRANSFER FROM F TO B  
 STITCH TRANSFER FROM B TO F

FIG. 3-5

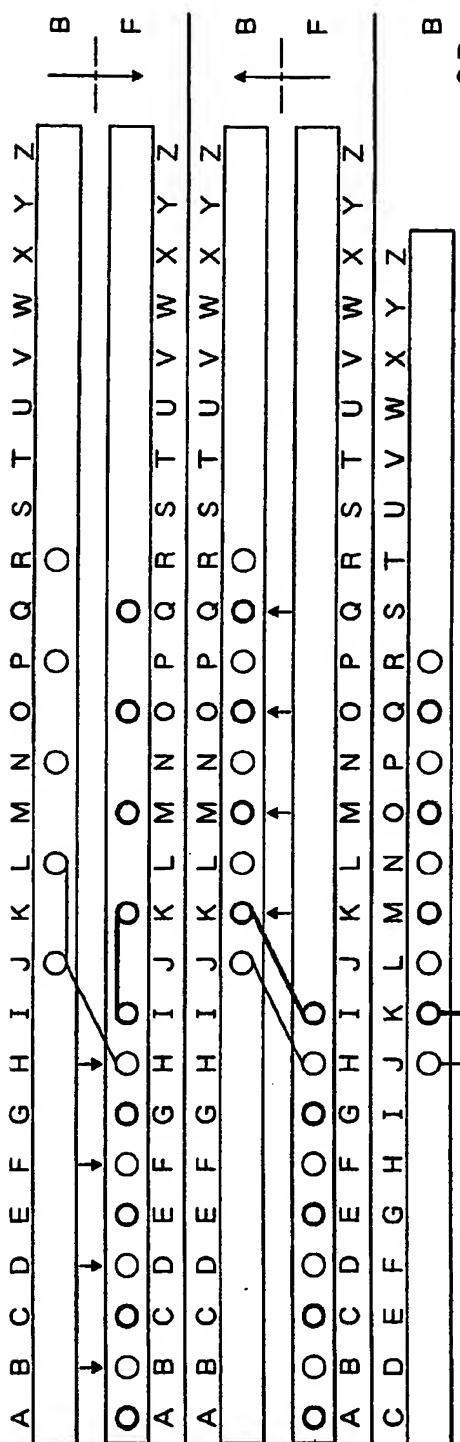


FIG. 3-6

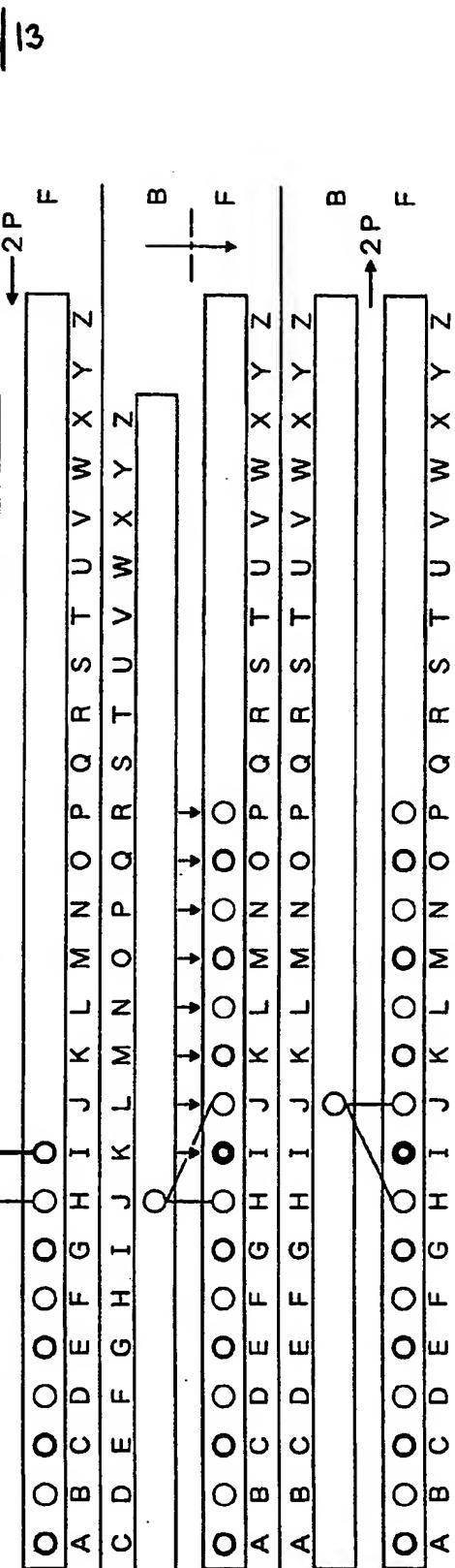


FIG. 3-7

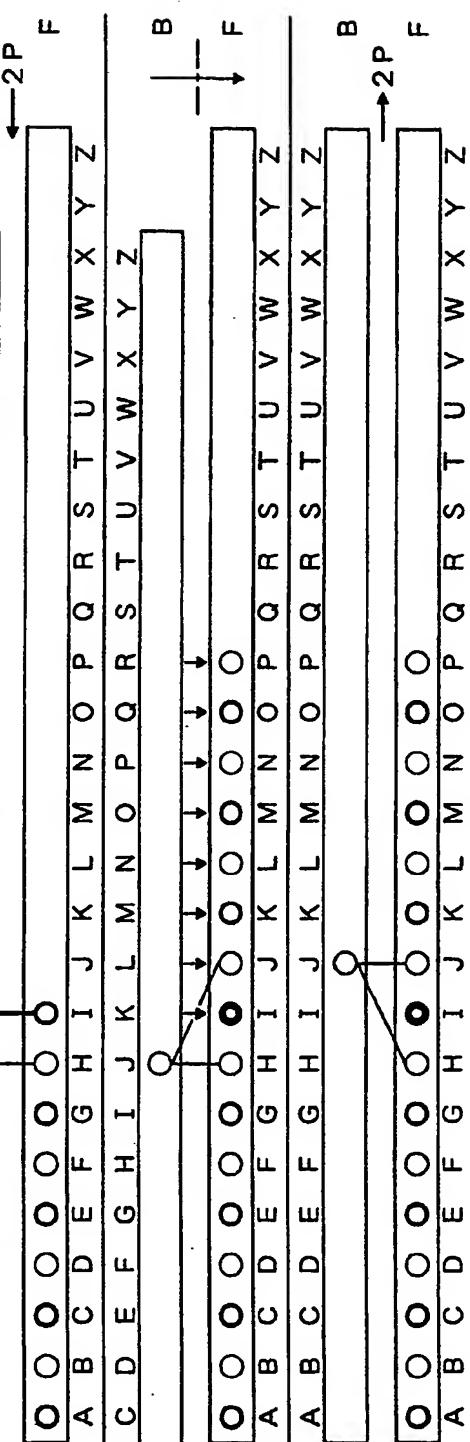


FIG. 3-8

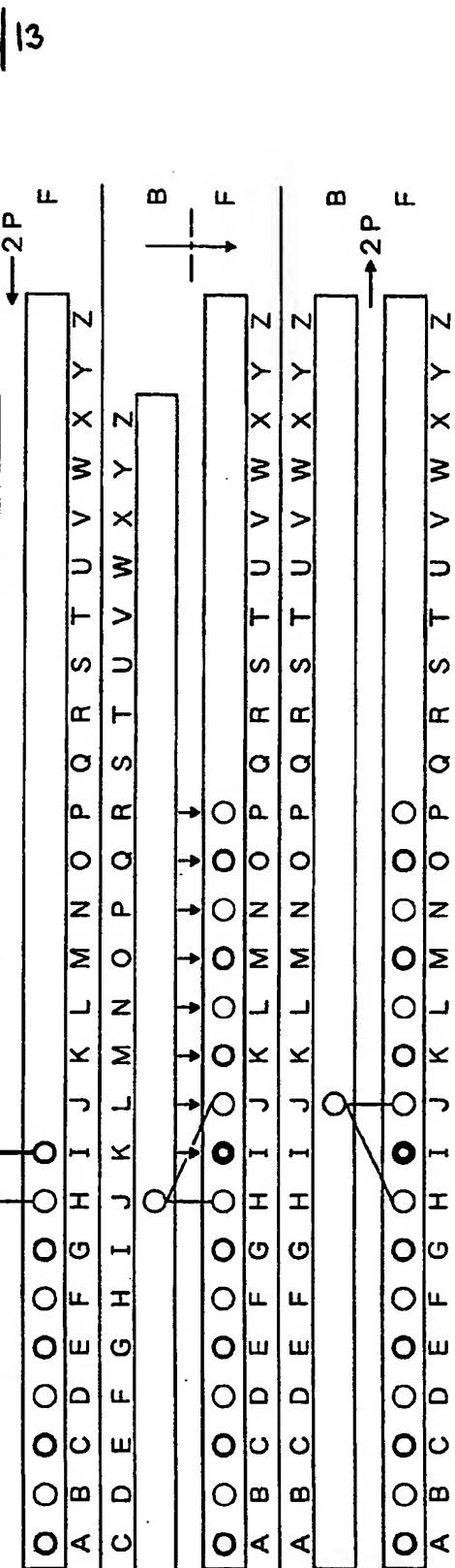
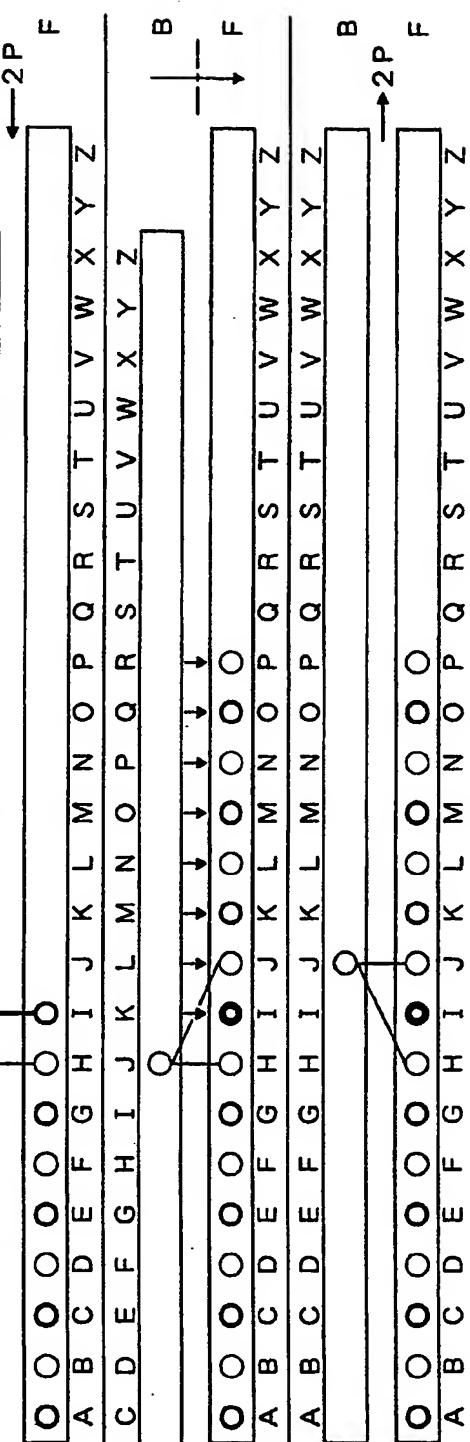
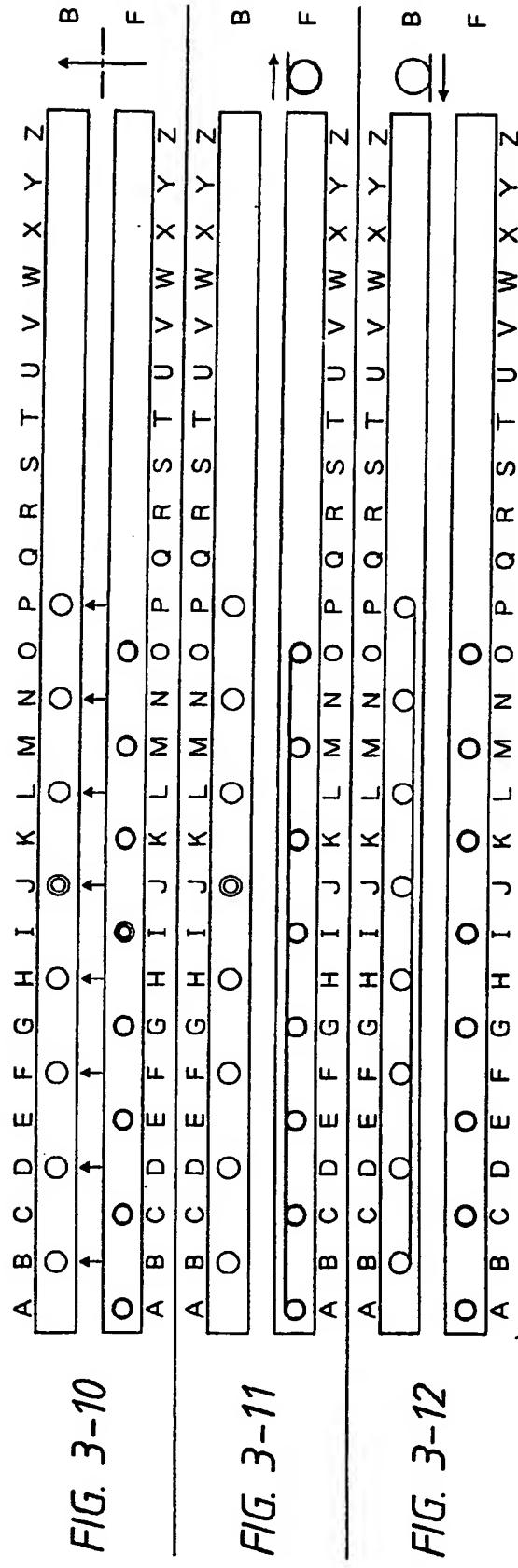


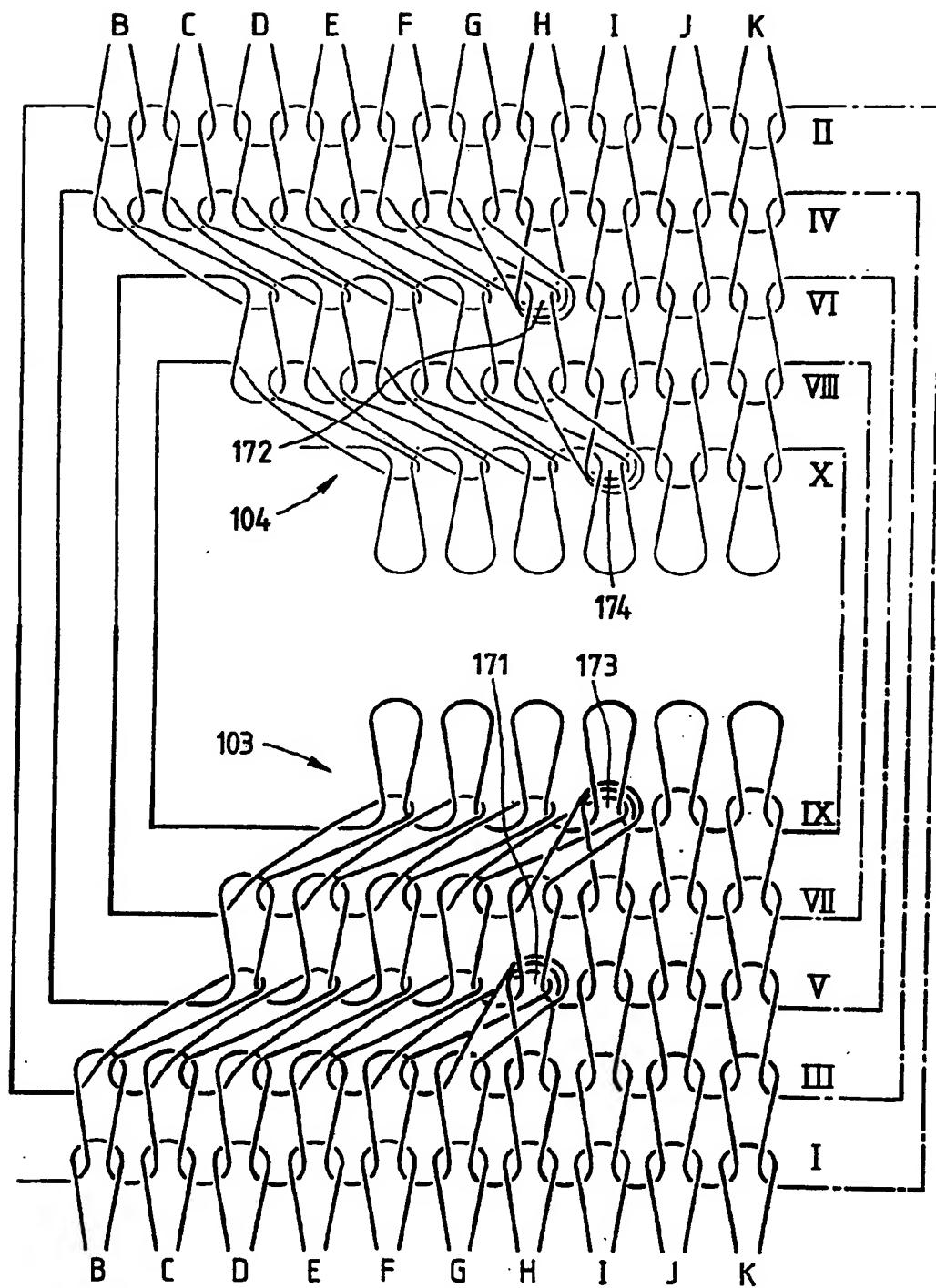
FIG. 3-9





- KNIT STITCH OF FRONT PIECE
- KNIT STITCH OF REAR PIECE
- WELT IN FRONT PIECE
- WELT IN REAR PIECE
- PUT A LOOP OF FRONT PIECE OVER ANOTHER LOOP OF FRONT PIECE
- PUT A LOOP OF REAR PIECE OVER ANOTHER LOOP OF REAR PIECE
- ↑ STITCH TRANSFER FROM F TO B
- ↓ STITCH TRANSFER FROM B TO F

FIG. 5



$\frac{7}{\sqrt{3}}$

FIG. 6-1

	A	B	C	D	E	F	G	H	I	J	K
BU	O	O	O	O	O	O	O	O	O	O	O
BD	O	O	O	O	O	O	O	O	O	O	O
FD	O	O	O	O	O	O	O	O	O	O	O
FU	O	O	O	O	O	O	O	O	O	O	O
	A	B	C	D	E	F	G	H	I	J	K
a	b	c	d	e	f	g	h	i	j	k	
BU	O	O	O	O	O	O	O	O	O	O	O
BD	O	O	O	O	O	O	O	O	O	O	O
FD	O	O	O	O	O	O	O	O	O	O	O
FU	O	O	O	O	O	O	O	O	O	O	O
	A	B	C	D	E	F	G	H	I	J	K
a	b	c	d	e	f	g	h	i	j	k	

FIG. 6-2

- KNIT STITCH OF FRONT PIECE
- KNIT STITCH OF REAR PIECE
- PUT A LOOP OF FRONT PIECE OVER ANOTHER LOOP OF FRONT PIECE
- PUT A LOOP OF REAR PIECE OVER ANOTHER LOOP OF REAR PIECE
- ↑ STITCH TRANSFER FROM F TO B
- ↓ STITCH TRANSFER FROM B TO F
- WELT IN FRONT PIECE
- WELT IN REAR PIECE

FIG. 6-3

a	B	C	D	E	F	G	H	I	J	K
	O	O	O	O	O	O	O	O	O	O
	O	O	O	O	O	O	O	O	O	O
	O	O	O	O	O	O	O	O	O	O
	O	O	O	O	O	O	O	O	O	O

FD      FU      FD      FU

TO      FD

FIG. 6-4

A	B	C	D	E	F	G	H	I	J	K
a	b	c	d	e	f	g	h	i	j	k
	O	O	O	O	O	O	O	O	O	O
	O	O	O	O	O	O	O	O	O	O
	O	O	O	O	O	O	O	O	O	O

FD      FU

TO      BD

FIG. 6-5

A	B	C	D	E	F	G	H	I	J	K
a	b	c	d	e	f	g	h	i	j	k
	O	O	O	O	O	O	O	O	O	O
	O	O	O	O	O	O	O	O	O	O
	O	O	O	O	O	O	O	O	O	O

FD      FU

TO      BD



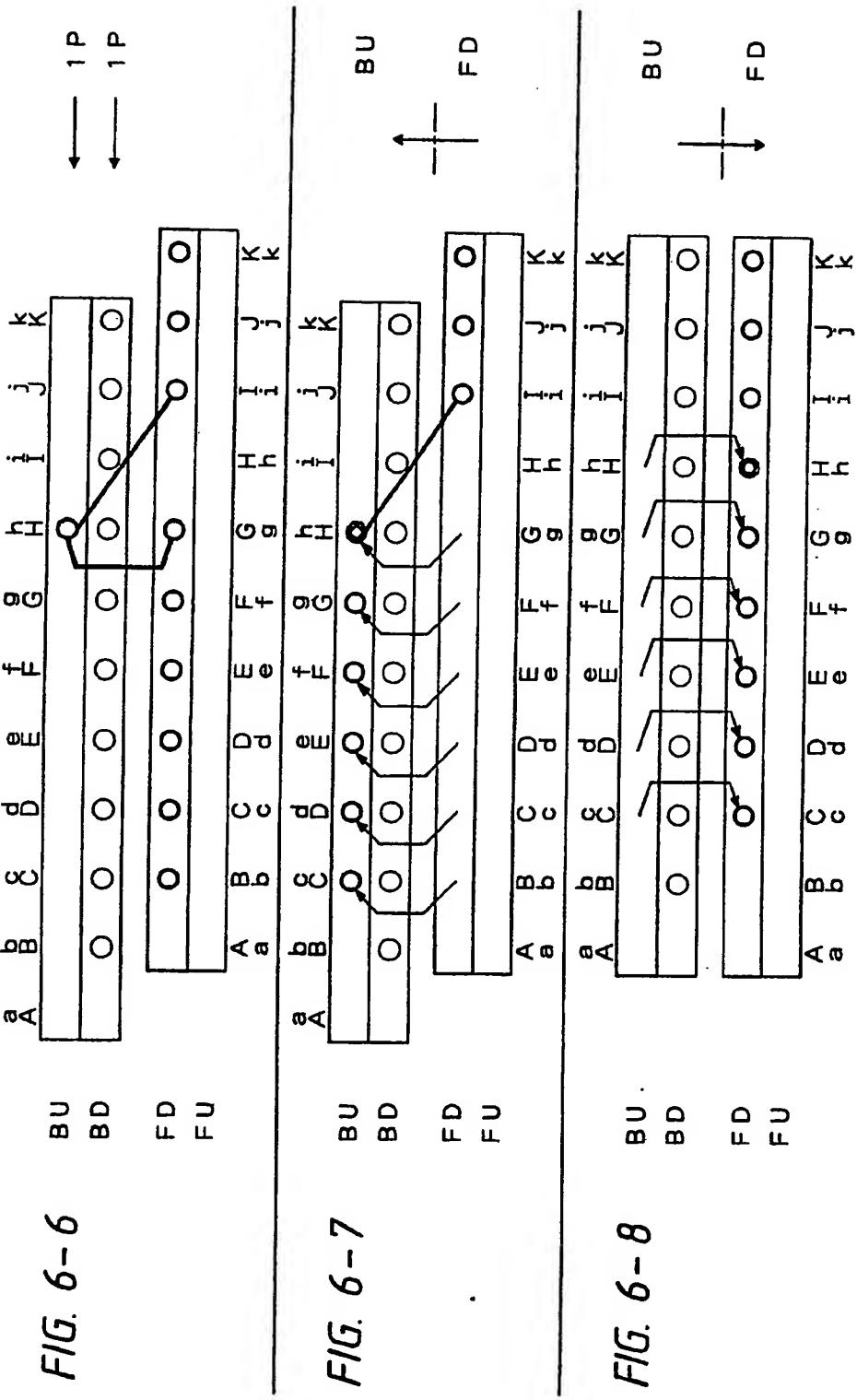


FIG. 6-9

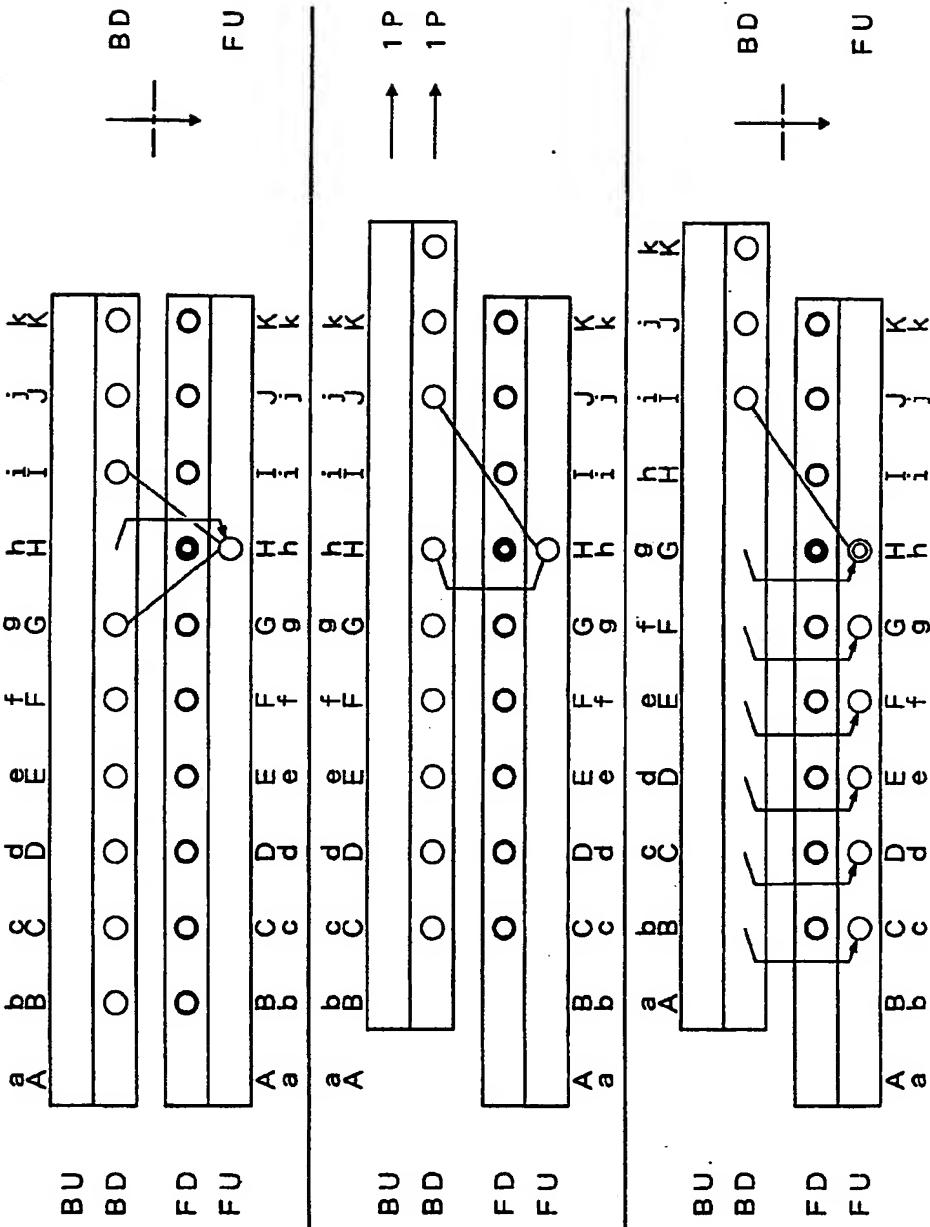


FIG. 6-10

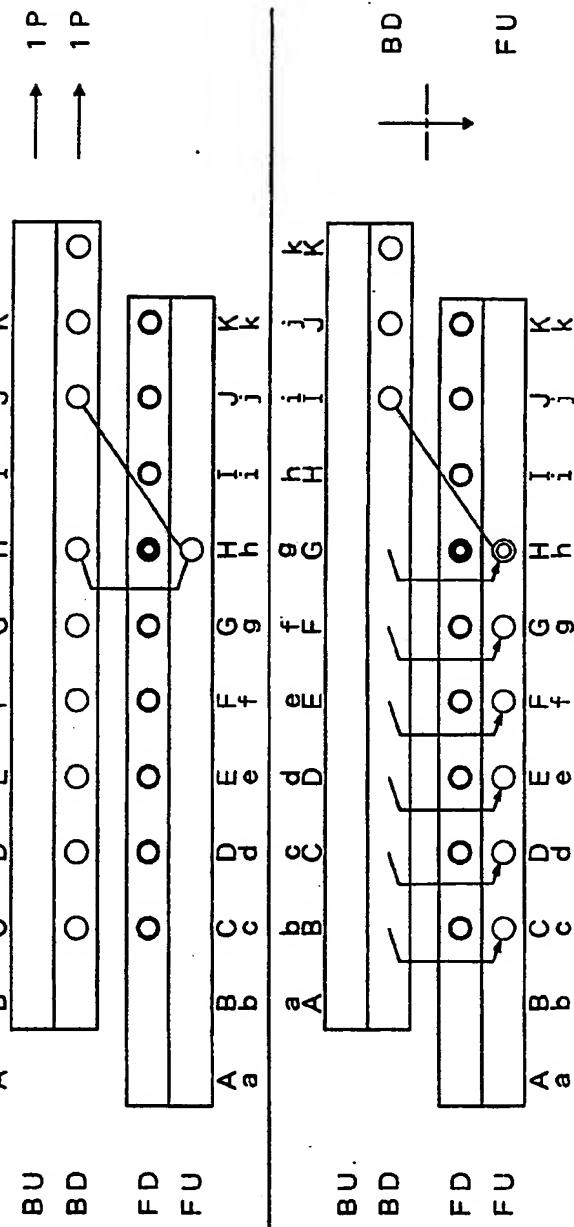


FIG. 6-11

FIG. 6-12

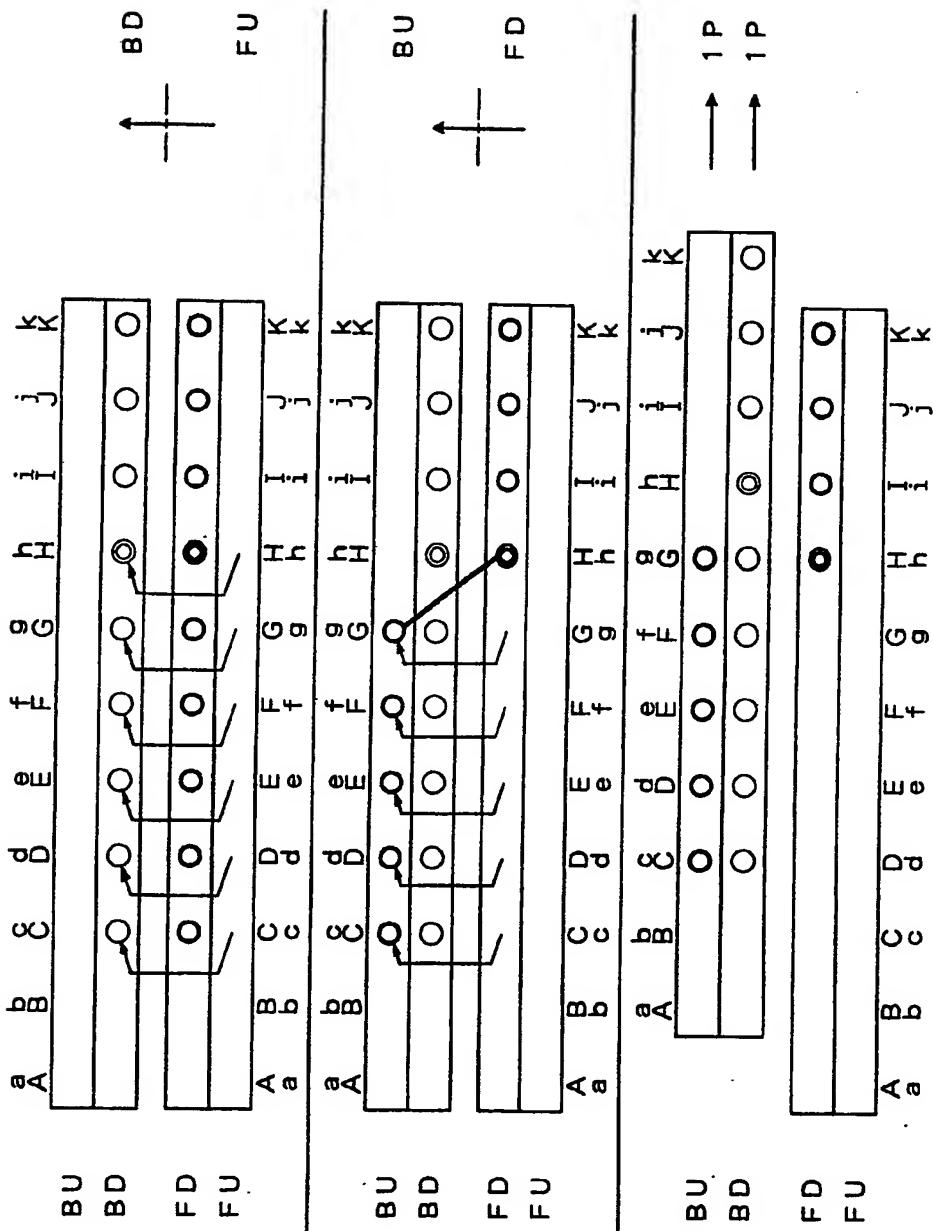


FIG. 6-13

FIG. 6-15

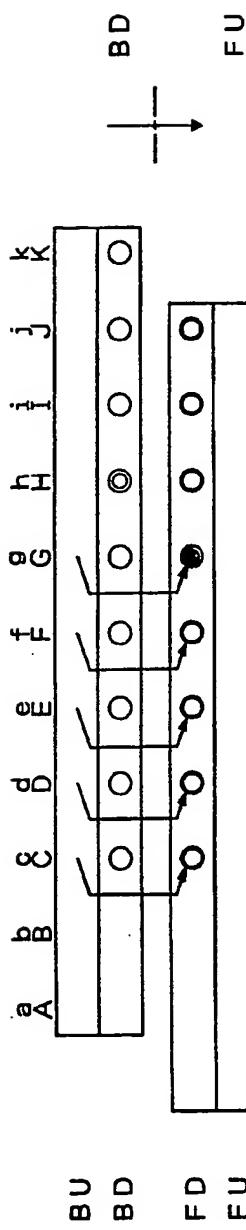


FIG. 6-16

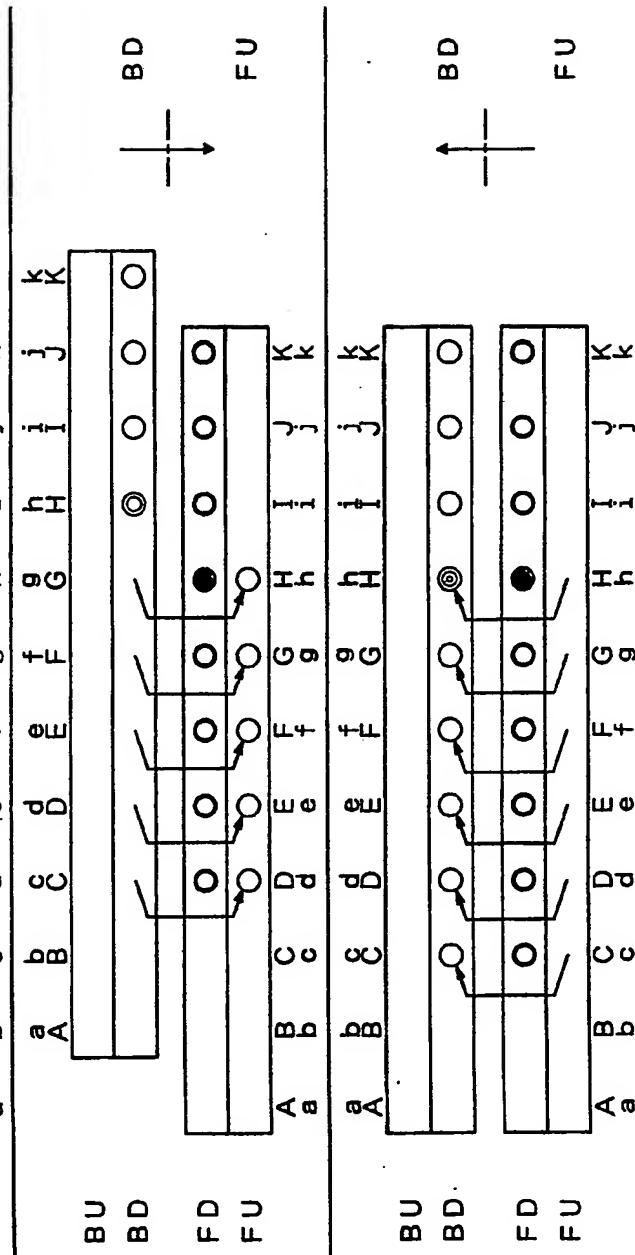
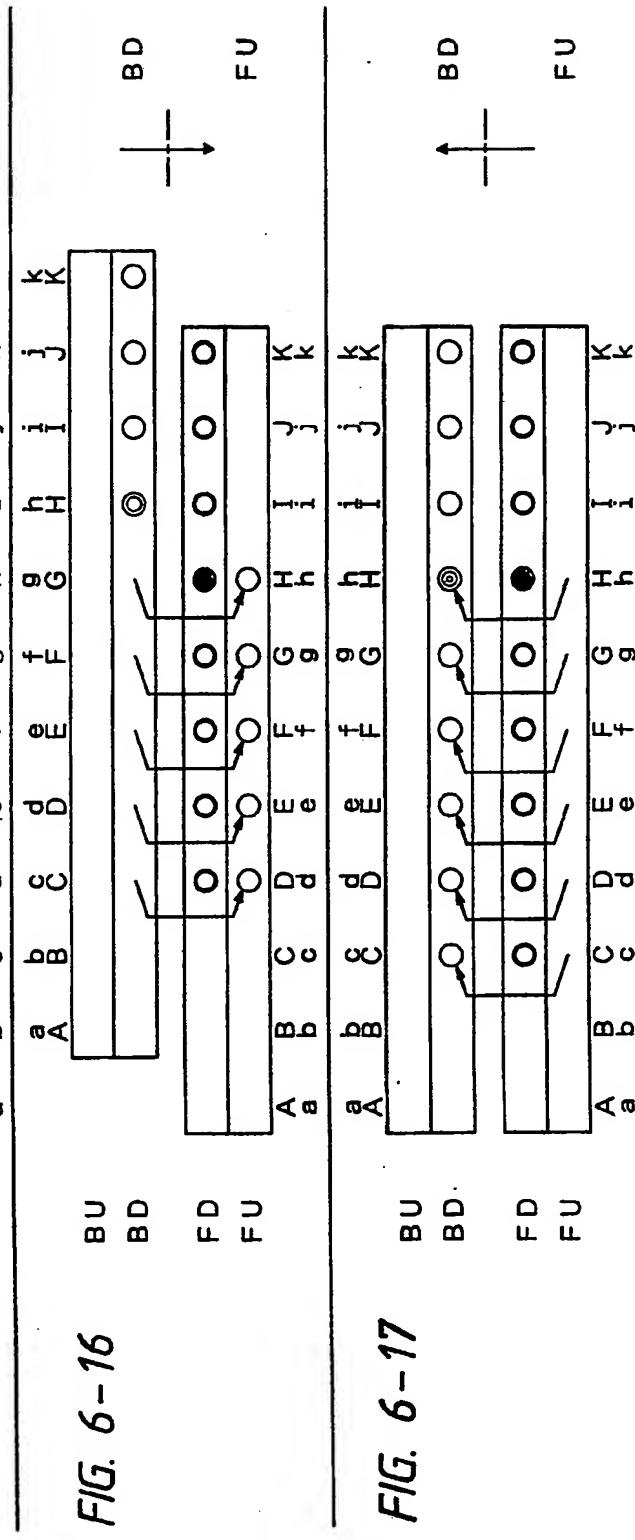


FIG. 6-17



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FIG. 6-18

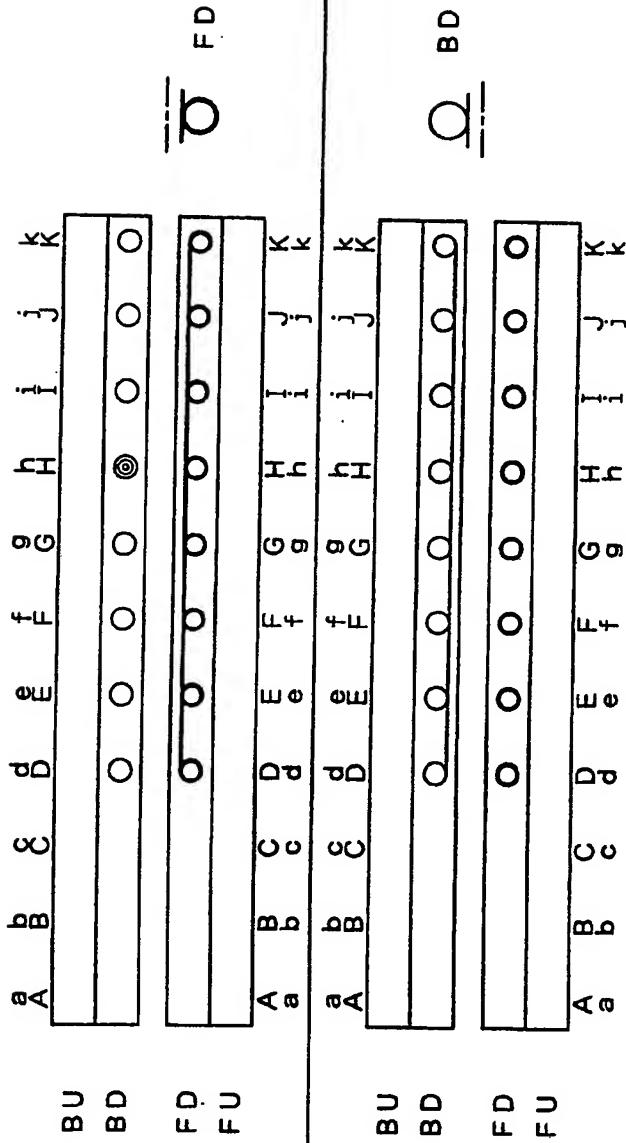
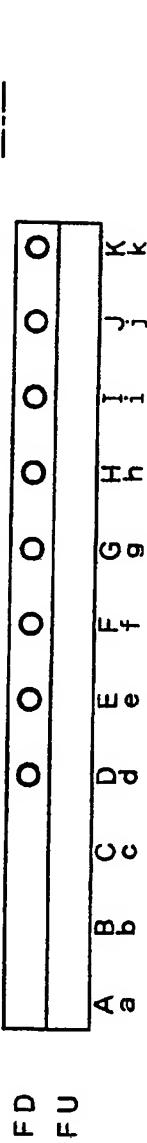


FIG. 6-19



○ KNIT STITCH OF FRONT PIECE

○ KNIT STITCH OF REAR PIECE

○ WELT IN FRONT PIECE

○ WELT IN REAR PIECE

● PUT A LOOP OF FRONT PIECE OVER ANOTHER LOOP OF FRONT PIECE

● PUT A LOOP OF REAR PIECE OVER ANOTHER LOOP OF REAR PIECE

↑ STITCH TRANSFER FROM F TO B

↓ STITCH TRANSFER FROM B TO F

METHOD OF KNITTING CYLINDRICAL KNITTED FABRICS

The present invention relates to a method of knitting which is used to integrally knit various portions knitted into a cylindrical configuration, such as clothing, by the use of a flat knitting machine, and particularly to a method of knitting cylindrical knitted fabrics which reduces the diameter of the cylindrical knitted fabrics.

10 It is already known prior to the filing of the present application to produce clothing and the like using knitted fabrics knitted by a flat knitting machine, wherein a sheet of knitted fabrics is knitted flat, and predetermined parts of an end edge thereof 15 are sewn together thereby to form a body portion or other portions into a cylindrical shape (Japanese Publication Nos. 23022/1982 and 53455/1982). However, in the thus obtained clothing and the like, the ends of the knitted fabrics are sewn together, and therefore 20 the sewn portion is poor in expansibility, and in addition, the sewn portion projects into the clothing, failing to obtain a satisfactory feel when worn, resulting in a poor fashionability, and sometimes producing fraying of pieced up sections. Moreover, 25 sewing work is necessary, which increases the production steps, and productivity is therefore not high.

In view of the aforementioned points, it is an object of the present invention to provide a method of 30 knitting for reducing knitted stitches in continuously and integrally knitting portions corresponding to the sewn parts in the step of knitting knitted fabrics, for knitting clothing which has heretofore been integrally finished by sewing various end edges of the knitted 35 fabrics constituting sleeves, a body and the like, to

knit a piece of clothing as a finished product, and to obtain knitted fabrics which are fashionable by selecting the way of overlapping of the loops in the knitting for reducing stitches so that the fashion lines can be produced at suitable positions.

The method comprises, in knitting knitted fabrics into a cylindrical configuration on a flat knitting machine, in a plurality of suitable courses, applying, towards a predetermined loop of a suitable wale, one or 10 more rackings to a loop adjacent to said predetermined loop of the same course and a loop of each wale to an end edge of knitted fabrics, forming an accumulated loop wherein the predetermined loop and the loop adjacent thereto are superposed a suitable number of 15 times thereby to reduce the width of the knitted fabrics, and producing fashion lines by rows of the accumulated loops formed in the plurality of courses.

When the knitted fabrics are knitted into a cylindrical configuration by a flat knitting machine 20 having opposed needle beds, superimposed on a predetermined loop of a suitable wale is a loop of a wale adjacent thereto, in a suitable course. That is, a loop from a loop adjacent to a predetermined loop to the end of the knitted fabrics is subjected to racking 25 towards a predetermined loop of a suitable wale. This operation is carried out a suitable number of times whereby a plurality of loops are accumulated on the predetermined loop and at the same time the knitting width is reduced. A plurality of said accumulated 30 loops are produced in the suitable course thereby to form fashion lines.

In order that the invention may be fully understood, two embodiments of the method of the invention will now be described by way of example and 35 with reference to the accompanying drawings, in which:

Figs. 1 to 3-12 and Figs. 4 to 6-19 show a first embodiment and a second embodiment, respectively.

Fig. 1 is a front view of a sweater knitted by a first method of the present invention;

5 Fig. 2 is a design view of set-in sleeve knitting which is the knitting design used to knit said sweater;

Figs. 3-1 to 3-12 are knitting views showing, by a sequence of steps, the state of loops of knitted fabrics engaged with needles of two needle beds and the 10 yarn feed;

Fig. 4 is a front view of a sweater knitted by a second method of the present invention;

Fig. 5 is a design view of gathering which is the knitting design used to knit the sweater of Fig. 4; and 15 Fig. 6-1 to 6-19 are knitting views showing, by a sequence of steps, the state of loops of knitted fabrics engaged with needles of four needle beds and the yarn feed.

The knitted fabrics to which the present invention 20 is applicable include set-in sleeve knitting, raglan sleeve knitting, etc. These knitted fabrics are knitted by a flat knitting machine having one or two beds abutted before and behind respectively.

As a first embodiment, a method for set-in sleeve 25 knitting which knits a sweater 1 as shown in Fig. 1 by the use of a 2-bed knitting machine including a front bed F and a rear bed B will be described hereinafter..

The sweater 1 is knitted into a cylindrical configuration by first separately knitting a body 30 portion 2 from the waist 3 and sleeves 4, 4 from the lower edge of a sleeve 5 respectively, and when three portions have been knitted to a predetermined length the three portions are integrally knitted from the lower portion of armholes 6, 6, and thereafter a 35 shoulder 9 is knitted. As an example of the set-in

sleeve knitting which will be described later, there is mentioned a course of a portion wherein a fashion line 7 extending upwardly from the armhole 6 terminates at a curved portion in a vertical line.

5 In the aforementioned portion of the sweater 1, sleeve cap lines 8, 8 at both left and right side ends of the knitted fabrics are inclined, and therefore the width of the knitted fabrics needs to be successively reduced. Therefore, stitch transfer is done stitch by 10 stitch to the adjacent wale in two courses to reduce the knitting width. By this stitch transfer, there is formed a fashion line wherein a portion having two loops superimposed extends in a vertical direction.

Knitting of knitted fabrics by set-in sleeve 15 knitting of which a design is shown in Fig. 2 will be described hereinafter with reference to Fig. 3.

The design view of set-in sleeve knitting shown in Fig. 2 shows the state where the knitted fabrics knitted into a cylindrical configuration by front and 20 rear needle beds are superimposed before and behind. The bold line indicates the knitted fabrics knitted by the front bed F, while the fine line indicates the knitted fabrics knitted by the rear bed B.

The design view of Fig. 2 only shows the right end 25 portion of the width of the knitted fabrics, and the knitted fabrics of similar design present on the left end portion is symmetrically (left and right) knitted by reciprocation of a carriage (not shown). Here, knitting of the right end portion will be described.

30 The course I in Fig. 2 is knitted by a needle of the front bed F. In Fig. 3-1, yarns are supplied to needles A, C, ... O, Q of the front bed F to knit the front knitted fabrics, and the carriage is reversed whereby the yarns are knitted by needles R, P, ... D, B 35 of the rear bed B to form course II of the rear knitted

fabrics (Fig. 3-2). The yarns having been subjected to the knitting of course II are inverted at the left end of the design view (not shown) to knit course III of the front knitted fabrics. In course III, the front 5 knitted fabrics are knitted, similarly to course I, by needles A, C, ... O, Q of the front bed F (Fig. 3-3), and the carriage is then inverted whereby course IV of the rear knitted fabrics are knitted by needles R, P, ... D of the rear bed B, similarly to course II (Fig. 10 3-4). Then, the knitting width is reduced by one stitch every four courses from course III and course IV (every two courses in a state where front and back knitted fabrics are developed). That is, a loop of course IV engaged with needles B, D, F and H of the 15 rear bed B is transferred to needles B, D, F and H of the front bed F (Fig. 3-5). The loop of course III engaged with needles K, M, O, Q of the front bed F is transferred to needles K, M, O, Q of the rear bed B (Fig. 3-6). In this state, racking of the rear bed B 20 for two needles in a left direction is made so that needles A, B, ... X of the front bed F are opposed to needles C, D, ... Z of the rear bed B (Fig. 3-7). The loop of course IV engaged with needles L, N, P, R of the rear bed B is transferred to needles J, L, N, P of 25 the front bed F, and the loop of course III transferred to needles K, M, O, Q of the rear bed B is transferred back to needles I, K, M, O of the front bed F. Thereby, the loop of needles K, M, O, Q of the front bed F of course III moves to adjacent needles I, K, M, 30 O and therefore the loop of needle K is superimposed on to the loop of needle I (Fig. 3-8). This is an overlap of loops indicated at 71, that is, an accumulation of loops, and a part of the fashion line 7 of the front knitted fabrics is formed. Next, racking is returned 35 so that needles A to Z of the front bed F and rear bed

B are opposed to one another (Fig. 3-9), and the loop of course IV transferred to needles B, D, ... N, P of the front bed F is transferred back to needles B, D, ... N, P of the rear bed B (Fig. 3-10). The loop of course IV engaged with needles L, N, P, R of the rear bed B moves to needles J, L, N, P and therefore the loop of needle L is superimposed on the loop of the needle J. This is an overlap of a loop indicated at 72 in Fig. 2, and a fashion line of the rear knitted 10 fabric (not shown) is formed.

Next, course V of the front knitted fabrics is knitted by needles A, C, ... M, O of the front bed F (Fig. 3-11), and course VI of the rear knitted fabrics is knitted by needles P, N, ... D, B of the rear bed B 15 (Fig. 3-12). After knitting of course VI, courses VII and VIII are knitted similarly to courses III and IV; the steps from Figs. 3-3 to Fig. 3-12 are repeated for knitting. The loop is transferred and loops are accumulated and the knitting width is reduced in a 20 manner similar to that as described above (knitting view is omitted).

A second embodiment of method for knitting a sweater 101 as shown in Fig. 4 using a 4-bed knitting machine including front beds FU, FD and rear beds BU, 25 BD will be described hereinafter. A fashion line formed by the gathering is indicated at 102. The design of that portion is shown in Fig. 5. Knitting of gathering knitted fabrics shown in the design view of Fig. 5 will be described hereinafter with reference to 30 Fig. 6.

The gathering design view shown in Fig. 5 shows the state where the front and rear knitted fabrics knitted into a cylindrical configuration by front and rear needle beds are developed. The bold line indicates 35 front knitted fabrics 103 knitted by upper and lower

front beds FU, FD and the fine line indicates rear knitted fabrics 104 knitted by upper and lower rear beds BU, BD. Stitch transfer of the knitted fabrics 103 and 104 is made to the adjacent wale every two 5 stitches every two courses to reduce the knitting width. By this stitch transfer, there is formed a fashion line 102 wherein a portion having three superimposed loops extends obliquely.

Court I in Fig. 5 is knitted by needles of the 10 lower front bed D. In Fig. 6-1, yarns are supplied to needles B, C, ... J, K of the lower front bed FD to knit front knitted fabrics, and the carriage is inverted whereby the yarns are knitted by needles K, J, ... C, B of the lower rear bed BD to form course II of 15 the rear knitted fabrics (Fig. 6-2). In the course III after the knitting of course II, front knitted fabrics are knitted similarly to course I by needles B, C, ... J, K of the lower front bed FD (Fig. 6-3), and then the carriage is inverted whereby course IV of the rear 20 knitted fabric is knitted by needles K, J, ... C, B of the lower rear bed BD similarly to course II (Fig. 6-4). The knitting width is reduced by two stitches every one course for both surface and back sides from the next course V and course VI. Reduction in knitting 25 width is carried out as follows. The loop of course II engaged with needle H of the lower front bed FB is transferred to needle h of the upper rear bed BU (Fig. 6-5). Then, racking of the upper and lower rear beds BU, BD is made to the left by one pitch (Fig. 6-6), and 30 the loop of course III engaged with needles B, C, ... F, G of the lower front bed FD is transferred to needles c,d, ... g, h of the upper rear bed BU (Fig. 6-7). Next, racking of the upper and lower rear beds BU, BD is made to the right by one pitch and the loop of 35 course III engaged with needles c,d ... g, h of the

upper rear bed BU is transferred to needles C, D, ... G, H of the lower front bed FD (Fig. 6-8). Thereby, in the design view shown in Fig. 5, a double loop is provided only on a wale H in course V, and the knitting width is reduced by one pitch. The illustrated design shows that in course V, the knitting width is further reduced by one pitch (2 pitches in total), but one pitch portion further reduced is again effected in course V after the reduction in knitting width of course VI in the rear knitted fabrics (indicated by the fine line). That is, racking for superimposing loops in the front and rear knitted fabrics is carried out alternately.

Next, in course IV of the rear knitted fabrics, the knitting width is reduced by one stitch. The loop of course IV engaged with needle H of the lower rear bed BD is transferred to needle h of the upper front bed FU (Fig. 6-9). Then, racking of the upper rear beds BU, BD is made to the right by one pitch (Fig. 6-10), and the loop of course IV engaged with needles B, C, ... F, G of the lower rear bed BD is transferred to needles c,d, ... g, h of the upper front bed FU (Fig. 6-11). Next, racking of the upper and lower front beds FU, FD is made to the left by one pitch, and the loop of course IV engaged with needles c,d, ... g, h of the upper front bed FU is transferred to needles C, D, ... G, H of the lower rear bed BD (Fig. 6-12). Thereby, in the design view shown in Fig. 5, a double loop is provided only on a wale H in course VI, and the knitting width is reduced by one pitch. In the illustrated design it can be seen that in course VI the knitting width is further reduced by one pitch (two pitches in total), but one pitch portion reduction is again effected in course VI after the further reduction in knitting width of course V in the surface side

(indicated by the bold line).

Next, a further reduction in stitch in the wale H of course V of the surface knitted fabrics will be described.

5 By the rightward movement of the carriage, the loop of course III engaged with needles C, D, ... F, G of the lower front bed FD is transferred to needles c, d, ... f, g of the upper rear bed BU (Fig. 6-13). Then, racking of the upper and lower rear beds BU, BD is made 10 to the right by one pitch (Fig. 6-14), and the loop of course III engaged with needles c, d, ... g, h of the upper rear bed BU is transferred to needles D, E, ... G, H of the lower front bed FD (Fig. 6-15). Thereby, in the design view shown in Fig. 5, a triple loop is 15 provided only on the wale H in course V and the knitting width is reduced by two pitches.

Next, knitting of the rear knitted fabrics proceeds.

That is, the loop of course VI engaged with needles 20 C, D, ... F, G of the lower rear bed BD which is subjected to racking to the right by one pitch is transferred to needles d, e, ... f, g of the upper front bed FU (Fig. 6-16). Racking of the upper and lower rear beds BU, BD is made to the left by one 25 pitch, and the loop of course III engaged with needles D, E, ... G, H of the upper front bed FU is transferred to needles d, e, ... g, h of the lower rear bed BD (Fig. 6-17).

Thereby a triple loop is provided in the wale H of 30 courses V and VII for both front and rear knitted fabrics, and the knitted fabrics reduced in knitting width by two stitches are obtained.

Next, knitting of courses VII and VIII is carried out.

35 Course VII is knitted by feeding yarns to needles

D, E, ... J, K of the lower front bed (Fig. 6-18), and the carriage is inverted whereby yarns are fed to needles K, J, ... E, D of the lower rear bed BD whereby course VIII is knitted (Fig. 6-19).

5 For courses IX and X in Fig. 5 the aforementioned knitting is repeated.

The knitted fabrics may be adjustably reduced in knitting width depending on the degree of accumulation of loops at loop-accumulated points 171, 172, 173, 174

10 ... of courses reduced in knitting width by the aforementioned knitting and the number of wales in which loops are accumulated.

Rows of said loop-accumulated points, that is 71, 73, ... and 171, 173 for the front knitted fabrics, and 15 72, 74, ... 172, 174 for the rear knitted fabrics, constitute fashion lines 7 and 102. Accordingly, if the accumulation of said loops is made to produce in the same wales, the fashion lines 7 and 102 form a vertical and straight line. In the case where the 20 wales produced are moved successively, the fashion lines are produced obliquely.

The present invention employs the method as described above. In obtaining knitted fabrics knitted into a cylindrical configuration wherein in the process 25 of knitting the knitting width is reduced and any sewing work is not required, the fashion lines produced by the knitting which extends at the desired angle and length may be produced by changing the order of movement of loops, rate of reduction of stitches to 30 courses or wales, the number of stitches transferred, and times of transfer.

## CLAIMS:

1. A method of knitting knitted fabrics on a flat knitting machine, the method comprising, in knitting 5 knitted fabrics into a cylindrical configuration, in a plurality of suitable courses, applying, towards a predetermined loop of a suitable wale, one or more rackings to a loop adjacent to said predetermined loop of the same course and a loop of each wale to an end 10 edge of knitted fabric, forming an accumulated loop wherein said predetermined loop and the loop adjacent thereto are superimposed an appropriate number of times thereby to reduce the width of the knitted fabric, and producing fashion lines by rows of said accumulated 15 loops formed in the plurality of courses.

2. A method of knitting knitted fabrics according to claim 1, wherein set-in sleeve knitting is knitted by using a two-bed knitting machine including a front bed and a rear bed, and stitch transfer is done stitch 20 by stitch to the adjacent wale in two courses to reduce the knitting width.

3. A method of knitting knitted fabrics according to claim 1, wherein raglan sleeve knitting is knitted by using a four-bed knitting machine including two 25 front beds and two rear beds, and stitch transfer of a front and rear knitted fabric is made to the adjacent wale every two stitches every two courses to reduce the knitting width.

4. A method of knitting substantially as 30 hereinbefore described with reference to the accompanying drawings.

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